

CONFIDENTIAL DRAFT

FEBRUARY 28, 1999

## E-BIOMED: A PROPOSAL FOR ELECTRONIC PUBLICATION IN THE BIOMEDICAL SCIENCES

### **Prologue**

It is widely recognized that electronic communication has the capacity to make dramatic changes in the way information is exchanged among all scientists, including biomedical scientists. Indeed there are many signs that such changes have already happened and are continuing to happen at a rapid rate.

Over the past decade, steeply increasing numbers of scientists of all types on all continents have abandoned traditional mail and FAXes in favor of electronic mail. Most log on to Genbank and many other data repositories on a nearly daily basis. The titles and abstracts of papers published in most scientific journals are available on line from the day of publication and sometimes even before; some full texts can be accessed electronically and downloaded, with or without subscription fees; and convenient sites, such as NIH's PubMed, provide powerful engines for searching the literature. In at least one field, physics, preprints are made available electronically to interested readers, through a server called "e-print". In other fields, including biology, laboratories frequently sustain World Wide Web pages that offer their colleagues deeper views of the data that support published findings, describe methods in great detail, illustrate the most recent talks given by the lab leader, and serve as important sources of specialized information and links to other Web sites and citations.

Despite these welcome and transforming changes, we believe that the full potential of electronic transmission has not yet been realized. In particular, we have made only sparing use thus far of the Internet as a means to publish scientific work. In this essay, we make a proposal for electronic publication of results in the biomedical sciences. We do this with the conviction that this means of publication can accelerate the dissemination of information, enrich the reading experience, deepen discussions among scientists, reduce frustrations with traditional mechanisms for publication, and save large sums of public and private money.

Before describing and defending our proposal, it is important to acknowledge the strengths of the currently used system for published scientific work, because it has, in general, served the scientific community well for a few centuries. Printed journals, particularly the few hundred leading representatives, do more than just transmit results to that community. They subject the reports to peer review and editing, a process that reassures busy readers that papers have been carefully scrutinized and affords the authors

an opportunity to improve their work based on the (generally anonymous) advice of their colleagues. The perceived hierarchy of the journals can confer status and grounds for career advancement on the authors of papers accepted by the most prestigious, and it provides a useful guide to readers besieged by the proliferation of published work. Moreover, current journals often frame the papers in attractive formats, bound within colorful covers and accompanied by commentaries, reviews, and various kinds of news, advertisements, and technical tips. In addition to being pleasurable to skim and to read, journals are usually convenient to carry, fitting nicely into briefcases and adapting to activities like riding the subway or sitting on the beach. And their very existence as "periodicals" implies a rhythm that can stimulate (in the best of circumstances) anticipation of forthcoming issues and their contents.

No proposal to change the way in which the publication of scientific results occurs should ignore these and other virtues of the current system. But we believe that current practices also have many liabilities and that these can be addressed by an evolutionary approach that need not threaten the virtues.

### **A proposal for e-biomed**

In the plan we present here, NIH would establish a electronic publishing site (called "e-biomed") for biomedical research in the many fields currently supported by NIH funds. Scientific reports in e-biomed would be filed in a common format (in the "e-biomed repository"), but many or most would be listed (in a sense, advertised) by "editorial boards"; these boards could be identical to those that represent current journals or they might be composed of members of scientific societies or other groups approved by an e-biomed Governing Board. Other reports would be deposited in a general file in the e-biomed repository if endorsed by at least two individuals with appropriate credentials.

According to this plan, authors would have at least two mechanisms whereby they could enter new scientific reports into the database. Most obviously, and most closely aligned with current practice, a report could be submitted (presumably electronically or on a diskette) to a journal and subjected to review by members of its editorial board. In contrast to current practice, three rather than two outcomes would be possible:

(i) The report might be accepted for publication, as is true now, in either its original or a revised form. The accepted report would immediately be deposited in e-biomed, and its title and list of authors would appear for a fixed period (a week, two weeks, or a month) on the current table of contents for that journal. After that period, it would continue to be accessible through the journal's home page, with the dates of submission and acceptance listed.

(ii) The report might be deemed appropriate for viewing by the scientific community, but judged not to meet the standards set by the journal for inclusion among its limited number of listings. To accommodate this situation, which seems likely to occur frequently, each journal would maintain one or more additional files for such reports. These additional files might be grouped by specialty or simply designated as larger, less exclusive version of the primary set of reports. Authors of reports that meet the criteria

set for these files---which, while less prestigious, still denote review and endorsement by the journal's editorial board --- could then elect immediate deposition in the e-biomed repository. Alternatively, they could choose to resubmit to another journal, as in current practice, hoping for inclusion among reports considered to have higher status.

(iii) Finally, the report might be judged unsuitable for deposition in e-biomed by the editorial board; authors could then submit to another board, defer further consideration of dissemination of the findings, or contemplate submission to e-biomed through the alternative mechanism described below.

Authors would also have the option of entering scientific reports directly into the e-biomed repository, without endorsement by an editorial board. To do this, the report would have to be approved by two individuals with appropriate credentials. These credentials would be established by the e-biomed governing board, and are expected to be broad enough to include thousands of scientists but stringent enough to avoid polluting the database with extraneous, false, or outrageous material; such credentials might be membership on any approved editorial board or receipt of an NIH research grant. Criteria for approval of reports are expected to be sufficiently firm to guard against gross contamination of the e-biomed repository, but sufficiently flexible to permit posting of virtually any credible work. At any time thereafter, the authors would be free to solicit an endorsement from specific editorial boards as a means to provide greater prestige to a paper. (The virtues and shortcomings of entering reports through this mechanism are discussed below.)

### **Inherent and prospective benefits of e-biomed**

We contend that establishment of the e-biomed system would deliver several powerful benefits to the scientific community with very little risk and with the opportunity for supplementing the system with further improvements in the near future. In this section, we describe some of the benefits that we envision and contrast them with the deficiencies of current publication methods.

#### More rapid dissemination of scientific information:

One of the least appealing features of the current methods for scientific publication is the lengthy pause that occurs between completion of a research report and its appearance on the printed page. Some of this time is consumed by the review process, especially when authors are obliged to submit their report sequentially to multiple journals before finding a suitable "home" for it. There is dispute about whether reports are often significantly improved to an extent appropriate to the duration of this process, especially when it is protracted (although, as discussed earlier, there is general agreement that the hierarchical position conferred on reports during the review phase is an important feature of contemporary life in biomedical science, influencing reading patterns and career trajectories). Additional time, generally a few months, is devoted to the journal production phase, once a report has been accepted for publication. Broader distribution by electronic publication is generally delayed for months beyond the time of publication,

although a few journals now go “on line” on the day of publication and a rare journal makes its reports available electronically at the time of acceptance.

Our proposal would markedly speed up the process at each phase. This would be especially so for reports that are entered directly into the e-biomed repository after being “approved” by two “members”. But even those reports reviewed and listed by editorial boards would be available earlier to the reading public because they would all be posted at the time of acceptance, eliminating the lag time now ascribable to publication on paper. Moreover, few reports would likely be reviewed by more than one editorial board; this too will significantly decrease the time that elapses between the drafting of a report and its transmission to interested readers. It is likely that more uniform electronic publishing will also speed the review period, because electronic methods will probably be more generally employed to submit, transfer, review, alter, and edit the reports. In fact, those editorial boards that develop the most efficient and most accessible review processes will compete more effectively for the outstanding reports.

#### Reduced expenses:

One of the most decried features of the current situation in biomedical publishing is the enormous cost of many of the journals, especially the costs charged to libraries and other institutions. (Such expenses have recently been the subject of a much publicised report--accessible at \_\_\_\_\_--and have been held responsible for the decline in publication of academic monographs [see The New York Review of Books, pp. , March , 1999].) While our proposal would not---and is not intended to---put an end to all subscription fees, a large number of journals would be likely to move to the much less expensive electronic format and a significant number would likely disappear in favor of the e-biomed repository. These important changes would offer savings to individuals (who are often trainees living on limited stipends), to institutions (which often complain about the fiscal pressures placed on them by technical activities), and to funding agencies (which would, of course, prefer to use their monies to support experimental activities).

#### Improved format for publication of modern biology:

More general use of electronic publishing through e-biomed would expedite the wider use of presentation methods that are now slowly gaining acceptance at web sites and supplements to print publications. With the dramatic expansion of space, it will be possible to present much larger data sets, provide more extensive analysis, and describe methods in the detail necessary to recapitulate the experiments. Moreover, electronic formats allow layered viewing at increasingly greater levels of detail, so that readers can get a concise message and then pursue information in proportion to need and interest. Publication in e-biomed would also offer many of the other advantages that are now obvious from the (delayed) transfer of journal articles into electronically accessible forms: hyperlinks to relevant literature, databases, and websites; registration for future retrieval of related papers; and other conveniences.

### Other possibilities:

The new system we are advocating here may seem like a radical change from some perspectives, but it also offers the prospect of evolution to still more changes. Among these is the possibility of engaging electively in a more open reviewing process---one in which critiques of the scientific reports are accessible and signed. This development, if widely accepted, could offer many benefits: more responsible reviews, an instructive and ongoing public conversation about published work, and career rewards for useful commentaries about the work of one's colleagues. The e-print repository might also serve as a communal site for advertising meetings and job opportunities; for providing synopses---or even full text with slides---of talks presented at scientific symposia; and for group discussions of a wide variety of scientific and political issues. Furthermore, electronic publication permits the amendment of reports, so that updated versions are announced and clearly denoted as changed, while the historical record is preserved as a 1.0 file and downloaded as such in regional repositories of printed versions for safekeeping. The sense of community that would be a natural outcome of shared use of e-biomed might be conducive to the adoption of uniform standards for sharing data and providing access to research tools described in e-biomed.

new forms of rapidly published paper journals for eclectic browsing  
especially when not in front of a computer screen  
uniform rules for data-sharing and access to research tools described in e-biomed

### **How do we get this started?**

We propose to publish our proposal for e-biomed in a widely-read journal, such as Science or Nature, in order to stimulate a much wider discussion that would inform any adjustments we might undertake prior to initiating the system. We hope to engage the editorial boards and publishers of existing journals, members of scientific societies, and the entire scientific community in an international debate that could last for a few months. At that point, the NIH would publish a revised statement that establishes the e-biomed web site, presumably with a general repository and editorial board listings as described earlier. The establishment and operation of the site would be supported with appropriated funds.

A Governing Board would be developed to represent both the NIH bioinformatics efforts (to be carried out under the auspices of the National Center for Biotechnology Information) and the participating editorial boards. The Board would be responsible for developing rules of operation, producing an annual budget projection, negotiating with groups asking to establish editorial boards, resolving disputes, and dealing with any other ancillary matters.

## **Consequences, concerns, and sources of resistance**

Despite the many benefits that might derive from the proposed e-biomed system, there will be legitimate sources of concern and even opposition to it. In this final section, we consider some of the most obvious questions that arise when thinking about the system for the first time.

### How would life change for the average user of the scientific literature?

Many gains, but any losses?

Three issues that concern most readers:

access to all relevant papers in special fields

guidance to papers of special merit (structuring the literature)

trans-disciplinary browsing (review articles, condensed reports)

These three need to be discussed in the context of the proposal

Virtually every reader would be delighted to escape from the daunting tower of irrelevant and expensive paper situated on nearly every desk in the scientific community

### How do we guarantee equity---for trainees, for authors at less prestigious or foreign sites, etc.?

Discuss submission procedures for reports (e.g. in developing countries), access to validators other than editorial boards...

### What would happen to existing journals?

Some might not change at all (e.g. Cell), at least in foreseeable future

Some might evolve and adapt (e.g. Nature or Science with fewer scientific reports, more news, summaries, reviews, etc.)

Some might be created to advertise and annotate (as in Current Topics in XYZ)

Some (many, most) might fold, transferring editorial boards to e-biomed site; this could be welcome change for those now not for profit (e.g. society journals) but heavily resisted by those produced by commercial publisher or by (officers of) societies that depend on income from journal subscriptions (this fight can

be won by appealing to the rank and file membership)

How would e-biomed intersect with PubMed and other bibliographical databases?

(advice needed here from NCBI; I assume this is straightforward)

## **Summary**

The advent of the electronic age and the rise of the Internet offer an unprecedented opportunity to change scientific publishing in ways that could improve virtually all aspects of the current system. The NIH proposes to address this opportunity with a new system, e-biomed, and welcomes constructive comments from the scientific community before putting the plan into operation.